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(71)出願人　000003551
株式会社東海理化電機製作所
愛知県丹羽郡大口町大字豊田字野田１番地

(72)発明者　木村　昭二
愛知県丹羽郡大口町大字豊田字野田１番地
株式会社東海理化電機製作所内

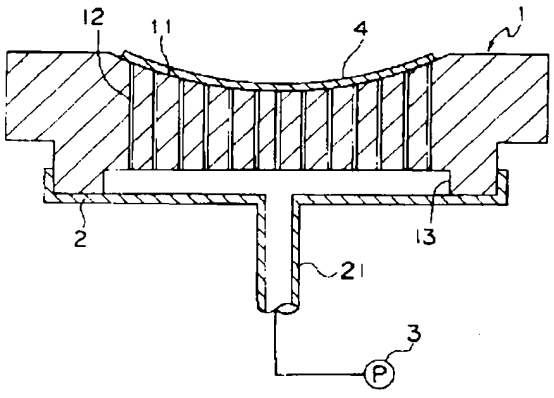
(74)代理人　弁理士　青山　葆　（外１名）

(54)【発明の名称】　板ガラス用曲げ型

(57)【要約】

【課題】　上面に形成された曲面状の曲げ凹部１１と、この曲げ凹部１１に連通する吸引穴１２とを備え、曲げ凹部１１に載せた板ガラス４を加熱しながら吸引穴１２から吸引することによって曲げ成形する板ガラス用曲げ型１において、その構成材料の密度を適切な値に設定してガラス４に対する十分な吸引圧力が得られるようにするとともに、曲げ型１自体の加熱性も十分な程度に保持する。

【解決手段】　曲げ型１を、密度が1.0~1.5g/cm³の焼結材料によって形成する。



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【特許請求の範囲】

【請求項１】　上面に形成された曲面状の曲げ凹部(11)と、該曲げ凹部(11)に連通する吸引穴(12)とを備え、曲げ凹部(11)に載せた板ガラス(4)を加熱しながら吸引穴(12)から吸引することによって曲げ成形する板ガラス用曲げ型であって、

密度が1.0～1.5g/cm³の焼結材料によって形成されたことを特徴とする板ガラス用曲げ型。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、板ガラス用曲げ型に関し、詳しくは、曲面状の曲げ凹部を有し、炉内で加熱した板ガラスを曲げ凹部に吸引して曲面形状に成形する板ガラス用曲げ型に関する。

【０００２】

【従来の技術】従来、板ガラス用曲げ型は、上面に形成された曲面状の曲げ凹部と、この曲げ凹部に連通する複数の吸引穴を有し、吸引穴には吸引ポンプが接続されている。そして、曲げ凹部の上に板ガラスを載せた状態で曲げ型を炉内に挿入し、ガラスと曲げ型を十分に加熱した後に吸引ポンプを起動してガラスを真空吸引することによって、ガラスを曲げ型の曲げ凹部に沿った曲面形状に成形している。なお、曲げ型は、例えば、体積比でSiO_2を約60%、Al_2O_3を約40%含み、密度が約0.5g/cm³のセラミック材料から形成されている。

【０００３】

【発明が解決しようとする課題】ところが、この構成の型を用いた場合、板ガラスが曲げ凹部の曲面に沿った形状にならず、例えば一部が屈曲したりして歪む場合があった。これは、曲げ型の材料が多孔質でしかも密度が比較的低いために、ポンプを運転したときに空気が吸引穴だけでなく曲げ型の表面からも吸引され、ガラスに対する吸引圧力が十分に得られないことが原因であると考えられる。これに対して、曲げ型の密度を上げ過ぎると、今度は型の加熱が不十分になりやすいという問題が発生する。

【０００４】したがって、本発明の解決すべき技術的課題は、曲げ型の構成材料の密度を適切な値に設定することによって、ガラスに対する十分な吸引圧力が得られるようにするとともに、曲げ型自体の加熱性が損なわれないようにすることである。

【０００５】

【課題を解決するための手段及び作用・効果】上述の技術的課題を解決するため、本発明に係る板ガラス用曲げ型は、密度が1.0～1.5g/cm³の焼結材料によって形成されたことを特徴としている。このように構成した曲げ型を用いた場合、吸引穴以外からの空気の吸引が減った結果、吸引圧力は、従来技術として説明した曲げ型において約22kPaであったものが、ポンプ圧を変えなくても約40kPaまで増加し、従来の約２倍の吸引圧力が得られた。

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そして、この曲げ型を用いて板ガラスを曲げ成形すると、板ガラスに歪みは生じず、曲げ凹部の曲面形状に沿った形に形成することができた。さらに、密度の上限を上記の値に設定したことによって、曲げ形自体の加熱性が大きく低下することも避けることができた。

【０００６】なお、密度が約0.5g/cm³の従来の曲げ型を用いる場合、ガラスの成形を繰り返すと、曲げ凹部の表面がガラスのエッジ部分によって摩耗しやすいため、週に１回から月に１回程度の割合で曲げ凹部を再研磨する必要があったが、密度を上記範囲に設定すると、耐摩耗性も大幅に改善された。例えば、密度が1.3g/cm³の曲げ型を用いた場合、耐摩耗性は、密度が約0.5g/cm³の曲げ型の約60倍になり、曲げ凹部の再研磨がほとんど必要ないほど耐摩耗性が改善された。

【０００７】

【発明の実施の形態】以下に、本発明の実施の形態について、図１及び図２を参照して詳細に説明する。

【０００８】図１はこの曲げ型にガラスを載せた状態での平面図であり、図２は図１のII－II線断面図で、曲げ型を台車に載せた状態を示している。曲げ型１の上面には、曲面状の曲げ凹部１１が形成されている。また、この曲げ型１は、上下方向に貫通して曲げ凹部１１に連通した吸引穴１２を備えている。

【０００９】曲げ型１は、炉内を走行するように構成された台車２の上に固定されている。曲げ型１の下面には凹部１３が形成されており、台車２の上面との間に、吸引穴１２に連通する空間が形成されている。台車２には、この空間とつながった吸引管２１が設けられており、この吸引管２１に吸引ポンプ３が接続されている。したがって、吸引ポンプ３を運転することにより、吸引管２１、凹部１３、吸引穴１２を介して曲げ凹部１１の上面の空気を吸引することができる。

【００１０】この曲げ型１を用いてガラスを曲げ加工する場合、まず、曲げ型１の曲げ凹部１１の上に平らな板ガラス４を載せた状態で、曲げ型１を加熱炉内に挿入する。そして、曲げ型１とガラス４を十分に加熱し、吸引ポンプを起動してガラス４を曲げ凹部１１の表面に所定時間吸引した後、徐冷炉内で徐々に冷却し、最後に炉から取り出して曲面ガラスの製品とする。

【００１１】

【実施例】次に、本発明に係る曲げ型の実施例と、２つの比較例について説明する。実施例では、密度が約1.3g/cm³で、かつ、SiO_2を体積比で52%、Al_2O_3を35%、MgOを12%、その他の成分を１%含むセラミック材料を用いて曲げ型１を形成し、２つの比較例においては、それぞれ、密度が0.5g/cm³及び2.0g/cm³の材料を用いて曲げ型１を形成した。

【００１２】第１の比較例において用いた密度が0.5g/cm³の曲げ型の材料は、従来から用いているものと同じ材料であり、加熱炉の温度は、従来の設定温度と同じ温度

である710℃に設定した。この温度は、板ガラス４の曲げ加工において必要な温度（具体的には600℃以上）に板ガラス４を加熱するために従来より設定されている温度である。また、ポンプ３の圧力も従来と同じく約40kPaに設定した。以上の設定値により、ガラス４は十分に加熱できたが、吸引圧力が22kPaしか得られず、ガラス４の曲げ不足が発生したり、ガラス４が歪んだりする等の不具合が発生した。

【００１３】　一方、第２の比較例として密度が2.0g/cm³の材料からなる曲げ型１を用いた場合、加熱炉の温度は800℃に設定した。これは、600℃以上のガラス温度を確保するためには、曲げ型の密度を高くするのにしたがって加熱炉の設定温度も上げる必要があるためである。しかし、実際にはこの温度でもガラス温度が十分に上がらないため曲げ型１上でガラス４があまり変形せず、したがって、型１とガラス４の隙間が大きくて、ポンプ３の圧力を40kPaに設定しても十分な吸引圧力は得られなかった。

【００１４】また、この例では、ガラス４が徐冷炉から出たところで全数割れてしまうという不具合が発生した。以上のことから、曲げ型の材料の密度を2.0g/cm³にする場合は、加熱炉の設定温度をさらに高くし、かつ徐冷帯を長くするか徐冷時間を長くすれば、ガラス４を曲げ成形することが可能と考えられるが、その場合はコストアップの問題が生じることになる。

【００１５】これに対して、密度が1.3g/cm³の材料で形成した本発明に係る曲げ型１を用いた場合は、加熱炉の温度を第１の比較例よりも50℃高い760℃に設定し、ポンプ３側の圧力を両比較例と同じ40kPaに設定したところ、ガラスが600℃以上に加熱され、しかも40kPaの吸引圧力が得られた。

【００１６】このように、曲げ型１の材料の密度を1.3g/cm³という値に設定したことによって、ポンプ圧を変えなくてもガラス４の吸引圧力が約40kPaと従来の約２倍になり、ガラス４を曲げ凹部１１に確実に吸引して、曲げ成形することができた。また、材料の密度を過度に高めることはしていないので、曲げ型１自体の加熱性が大きく低下することもなかった。さらに、曲げ型１の密度を従来の0.5g/cm³から1.3g/cm³にしたことによって、耐摩耗性が約60倍になり、ガラス４の成形を繰り返しても、曲げ凹部１１の表面はほとんど摩耗せず、曲げ凹部１１の再研磨がほとんど必要ないほどであった。

【００１７】なお、上記実施例においては、曲げ型１の材料の密度を約1.3g/cm³に設定しているが、密度は必ずしもこの値に限定しなくてもよく、1.0～1.5g/cm³程度の値であれば、曲げ型１の加熱性を大きく損なわず、しかもガラス４の吸引圧力を高めることができ、さらに耐摩耗性も改善することができる。

【図面の簡単な説明】

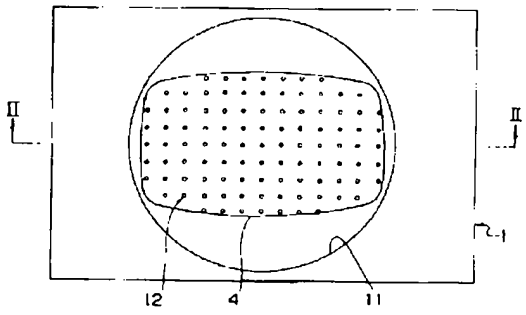
【図１】　本発明に係る板ガラス用曲げ型に板ガラスを載せた状態での平面図である。

【図２】　図１のII－II線断面図であり、曲げ型を台車に載せた状態を示している。

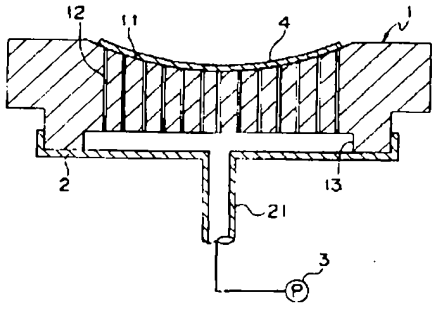
【符号の説明】

１　曲げ型
２　台車
３　吸引ポンプ
４　板ガラス
１１　曲げ凹部
１２　吸引穴
１３　凹部
２１　吸引管

【図１】



【図２】



PATENT ABSTRACTS OF JAPAN

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(71)Applicant : TOKAI RIKA CO LTD

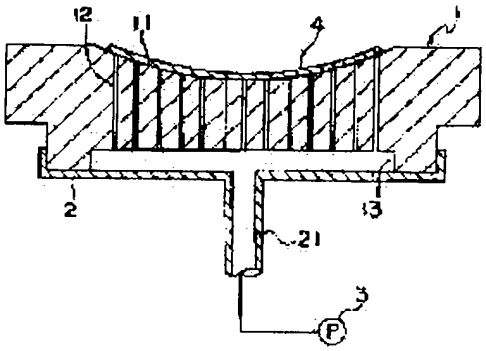
(72)Inventor : KIMURA SHOJI

(54) BENDING TEMPLATE FOR SHEET GLASS

(57)Abstract:

PROBLEM TO BE SOLVED: To enable the application of sufficient suction pressure on glass while preventing the loss of heating properties of a bending template itself by forming the bending template using a sintered material having a specific density.

SOLUTION: The density of the material of a bending template 1 is 1.0-1.5g/cm3. When used the material, the suction pressure on a sheet glass 4 becomes about two times the conventional suction pressure even without changing the pressure of a suction pump 3, and the sheet glass 4 is surely sucked onto the curved dent 11 to shape the curve of the sheet glass. Further, the density of the material is not excessively increased so that the heating properties of the bending template 1 itself is not largely decreased. Further more, the increase in the density from the conventional material heightens abrasion resistance extremely, and the surface of the bending dent 11 is hardly abraded even after repeated shaping of sheet glasses, and re-polishing of the surface of the bending dent 11 is hardly needed.



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DERWENT-ACC-NO: 1998-433546

DERWENT-WEEK: 199837

TITLE: Curvature bending die for moulding glass plates - has suction hole formed below curved recess through which fused glass poured on recess is sucked to mould glass plate

PATENT-ASSIGNEE: TOKAI RIKA DENKI KK[TOJY]

PRIORITY-DATA: 1996JP-0345094 (December 25, 1996)

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JP 10182176A	N/A	1996JP-0345094	December 25, 1996

INT-CL (IPC): C03B023/035

ABSTRACTED-PUB-NO: JP 10182176A

BASIC-ABSTRACT:

The bending die (1) has a curved surface (11) on the top. A number of suction holes (12) connect a recess (13) of the die to the curved surface. A heated glass plate (4) is placed in the curved surface part of the die. Suction is created below the plate by a vacuum pump (3). The fused glass which gets

sucked from below, bends according to the shape of the curved surface. The die
is made of a sintered material of density 1.0-1.5 g/cc.

ADVANTAGE - Doubles suction pressure by decreasing suction of air through die
other than suction holes. Bends glass plate without producing distortion.
Minimises change of shape of curved surface even after repeated use. Improves
wear resistance.

CHOSEN-DRAWING: Dwg.2/2

TITLE-TERMS: CURVE BEND DIE MOULD GLASS PLATE SUCTION HOLE FORMING BELOW CURVE
RECESS THROUGH FUSE GLASS POUR RECESS SUCK MOULD GLASS PLATE

DERWENT-CLASS: L01

CPI-CODES: L01-E06; L01-G10; L01-L05;

SECONDARY-ACC-NO:
CPI Secondary Accession Numbers: C1998-130923

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The bending die for sheet glass which is a bending die for sheet glass bent and fabricated by drawing in from a suction hole (12), heating the sheet glass (4) which was equipped with the suction hole (12) which is open for free passage to the bending crevice (11) and this bending crevice (11) of the shape of a curved surface formed in the upper surface, and was put on the bending crevice (11), and is characterized by what density was formed for of the sintered material of 1.0 - 1.5 g/cm3.

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the bending die for sheet glass which has a curved-surface-like bending crevice, bends in detail the sheet glass heated in the furnace about the bending die for sheet glass, attracts to a crevice, and is fabricated in a curved-surface configuration.
[0002]
[Description of the Prior Art] Conventionally, the bending die for sheet glass has two or more suction holes which are open for free passage to the bending crevice and this bending crevice of the shape of a curved surface formed in the upper surface, and the suction pump is connected to the suction hole. And after inserting a bending die into a furnace where sheet glass is carried on a bending crevice, and fully heating glass and a bending die, glass is fabricated in the curved-surface configuration where the bending crevice of a bending die was met, by starting a suction pump and carrying out vacuum suction of the glass. In addition, as for the bending die, density is formed from the ceramic material of about 0.5 g/cm3 about 60% in SiO2 by the volume ratio, including aluminum 2O3 about 40%.
[0003]
[Problem(s) to be Solved by the Invention] However, when the mold of this composition was used, it did not become the configuration where sheet glass bent and the curved surface of a crevice was met, for example, there was a case where a part was crooked and distorted. As for this, it is considered to be the cause that air is attracted also from the front face of not only a suction hole but a bending die by porosity when density moreover operates [the material of a bending die] a pump to a low sake comparatively, and the suction pressure to glass is not fully obtained. On the other hand, if the density of a bending die is raised too much, the problem that heating of a mold tends to become inadequate shortly will occur.
[0004] Therefore, the technical technical problem which should solve this invention is that the heating nature of the bending die itself is made not to be spoiled while sufficient suction pressure to glass is obtained by setting the density of the component of a bending die as a suitable value.
[0005]
[Means for Solving the Problem and its Function and Effect] In order to solve an above-mentioned technical technical problem, the bending die for sheet glass concerning this invention is characterized by what density was formed for of the sintered material of 1.0 - 1.5 g/cm3. Thus, when the constituted bending die is used, as a result of suction of the air from other than a suction hole decreasing, suction pressure increased up to about 40 kPa(s), even if what was about 22 kPa(s) did not change a pumping pressure in the bending die explained as conventional technology, and twice [over the past / about] as many suction pressure as this was obtained. And when sheet glass was bent and fabricated using this bending die, distortion was not produced in sheet glass but it was able to form in the form where the curved-surface configuration of a bending crevice was met. Furthermore, it was also avoidable by having set the upper limit of density as the above-mentioned value that the heating nature of the bending form itself falls greatly.

[0006] In addition, although it needed to bend at about 1 time of a rate per month from 1 time per week and the crevice needed to be regrinded since it tends to have worn the front face of a bending crevice out by the edge portion of glass when density used the conventional bending die of about 0.5 g/cm3, and fabrication of glass was repeated, if density was set as the above-mentioned range, abrasion resistance will also have been improved sharply. For example, when density uses the bending die of 1.3 g/cm3, abrasion resistance has been improved, so that the need [abrasion resistance / density increased about 60 times of the bending die of about 0.5 g/cm3 and / regrinding of a bending crevice] hardly.
[0007]
[Embodiments of the Invention] Below, the gestalt of operation of this invention is explained in detail with reference to drawing 1 and drawing 2 .
[0008] Drawing 1 is a plan in the state where glass was put on this bending die, and drawing 2 is the II-II line cross section of drawing 1 , and shows the state where the bending die was put on the truck. The curved-surface-like bending crevice 11 is formed in the upper surface of a bending die 1. Moreover, this bending die 1 is equipped with the suction hole 12 which penetrated and bent in the vertical direction and was open for free passage to the crevice 11.
[0009] The bending die 1 is being fixed on the truck 2 constituted so that it might run in a furnace. The crevice 13 is formed in the inferior surface of tongue of a bending die 1, and the space which is open for free passage in the suction hole 12 is formed between the upper surfaces of a truck 2. The siphon 21 connected with this space is formed in the truck 2, and the suction pump 3 is connected to this siphon 21. Therefore, by operating a suction pump 3, it can bend through the siphon 21, a crevice 13, and the suction hole 12, and the air of the upper surface of a crevice 11 can be attracted.
[0010] When carrying out bending of the glass using this bending die 1, where flat sheet glass 4 is carried on the bending crevice 11 of a bending die 1, a bending die 1 is first inserted into a heating furnace. And after fully heating a bending die 1 and glass 4, starting a suction pump, bending glass 4 and and carrying out predetermined-time suction on the front face of a crevice 11, it cools gradually within a lehr, finally it takes out from a furnace, and considers as the product of curved-surface glass.
[0011]
[Example] Next, the example of the bending die concerning this invention and two examples of comparison are explained. The bending die 1 was formed using the ceramic material in which about 1.3g /of densities is [cm] 3 in the example, and aluminum 2O3 is included for SiO2 52% by the volume ratio, and they include other components for MgO 1% 12% 35%, and density formed the bending die 1 in two examples of comparison using the material of 0.5 g/cm3 and 2.0 g/cm3, respectively.
[0012] The material of the bending die of 0.5 g/cm3 is the same material as what is used from the former, and the density used in the 1st example of comparison set the temperature of a heating furnace as 710 degrees C which is the same temperature as the conventional setting temperature. This temperature is temperature set up conventionally, in order to heat sheet glass 4 to required temperature (specifically 600 degrees C or more) in bending of sheet glass 4. Moreover, the pressure of a pump 3 as well as the former was set as about 40 kPa(s). Although glass 4 has fully been heated with the above set point, suction pressure was obtained only for 22kPa(s), but the shortage of bending of glass 4 occurred, glass 4 was distorted, and fault, such as carrying out, occurred.
[0013] On the other hand, when the bending die 1 which density becomes from the material of 2.0 g/cm3 as 2nd example of comparison was used, the temperature of a heating furnace was set as 800 degrees C. This is because the setting temperature of a heating furnace also needs to raise the density of a bending die according to making it high, in order to secure the glass temperature of 600 degrees C or more. However, in order that glass temperature might not fully go up by this temperature in fact, even if glass 4 seldom deformed on the bending die 1, therefore the crevice between a mold 1 and glass 4 was large and set the pressure of a pump 3 as 40kPa(s), sufficient suction pressure was not obtained.
[0014] moreover, the place to which glass 4 came out of the lehr in this example -- total crack ****** -- it might be unacquainted and fault occurred Although it is thought possible to bend and fabricate glass 4 from the above thing if setting temperature of a heating furnace is made still higher, a lehr is lengthened or annealing time is lengthened, when making density of the material of a bending die into 2.0 g/cm3,

the problem of a cost rise will arise in that case.
[0015] On the other hand, when the bending die 1 concerning this invention which density formed with the material of 1.3 g/cm3 was used, the temperature of a heating furnace was set as 760 degrees C higher 50 degrees C than the 1st example of comparison and the pressure by the side of a pump 3 was set as the same 40kPa(s) as the example of both comparison, glass was heated by 600 degrees C or more, and, moreover, the suction pressure of 40kPa(s) was obtained.
[0016] Thus, by having set the density of the material of a bending die 1 as the value of 1.3 g/cm3, even if it did not change a pumping pressure, the suction pressure of glass 4 doubled [over the past / about] to about 40 kPa(s), glass 4 was bent, and it was able to draw in certainly to the crevice 11, and was able to bend and fabricate to it. Moreover, since it had not carried out raising the density of material too much, the heating nature of bending-die 1 the very thing did not fall greatly. Furthermore, even if abrasion resistance increased about 60 times and repeated fabrication of glass 4 by having made density of a bending die 1 into 1.3 g/cm3 from the conventional 0.5 g/cm3, the front face of the bending crevice 11 was hardly worn out, but was like [need / hardly / regrinding of the bending crevice 11 / like].
[0017] In addition, it is not necessary to necessarily limit density to this value, and in the above-mentioned example, although the density of the material of a bending die 1 is set as about 1.3 g/cm3, if it is an about three 1.0 - 1.5 g/cm value, it cannot spoil the heating nature of a bending die 1 greatly, but moreover can heighten the suction pressure of glass 4, and can also improve abrasion resistance further.

[Translation done.]